IN THE NAME OF GOD

Qazvin university of medical science
Department of Immunology & Microbiology

JOURNAL CLUB & MSC SEMINAR

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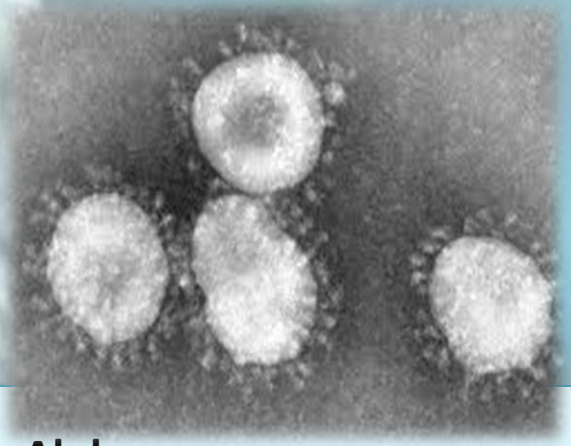
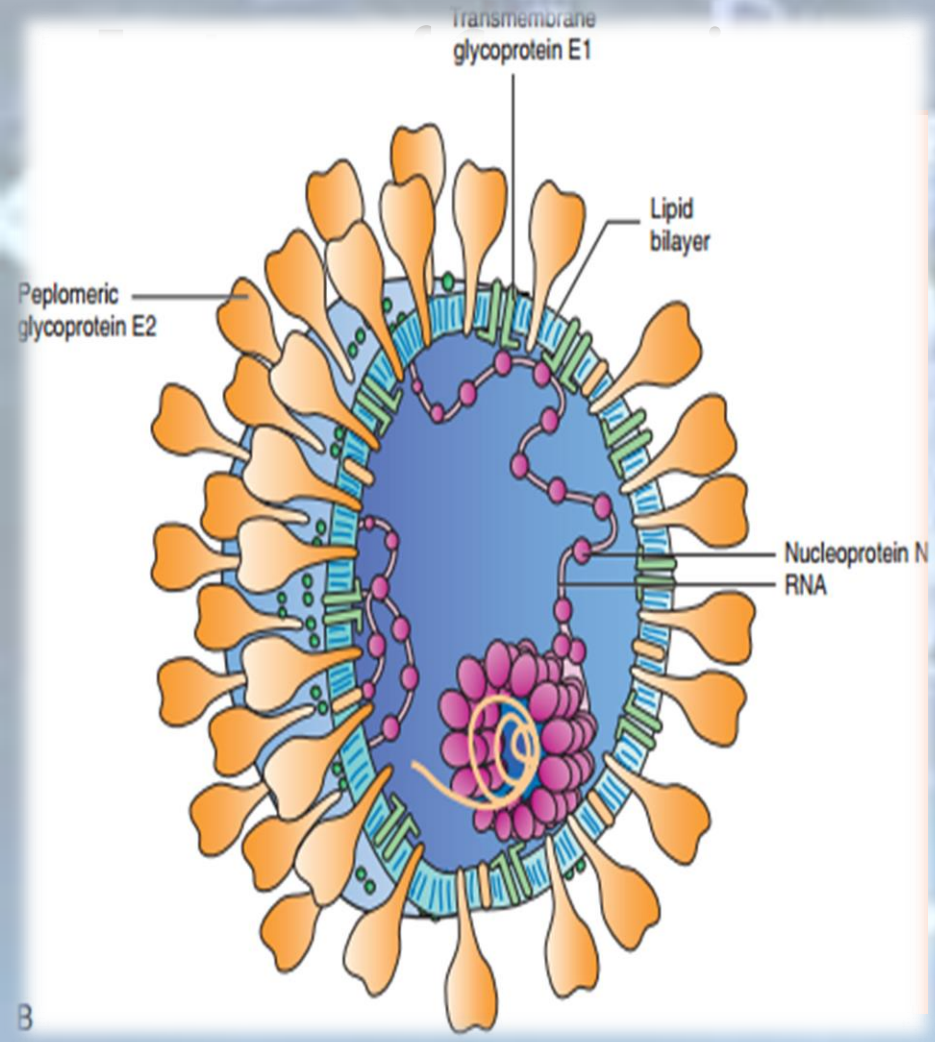
CORONAVIRUS CLASSIFICATION

- Order: *Nidovirales* (4 Families) history
  - Family: *Arteriviridae* (1 Genus) history
  - Family: *Coronaviridae* (2 Subfamilies) history
    - Subfamily: *Coronavirinae* (4 Genera) history
      - Genus: *Alphacoronavirus* (8 Species) history
      - Genus: *Betacoronavirus*
        - Species: *Betacoronavirus 1*
        - Species: *Human coronavirus HKU1*
        - Species: *Murine coronavirus*
        - Species: *Pipistrellus bat coronavirus HKU5*
        - Species: *Rousettus bat coronavirus HKU9*



- **Alpha**
  - human examples: hcov -229E, hcov -NL63
  - pig, dog, and cat covs
- **beta**
  - hcov -OC43, hcov -HKU1, hcov -**SARS**
  - MHV, rat, pig and cow covs
  - **mers-cov**
- **gamma**
  - chicken and turkey covs
- **delta**
  - bird covs

CORONAVIRUSES (COVS):



Non-sars Human Covs: Epidemiology

Non-SARS Human CoVs: Clinical Spectrum of Illness

Severe Acute Respiratory Syndrome (SARS)

SARS - morbidity

Clinical course - triphasic

Week 1

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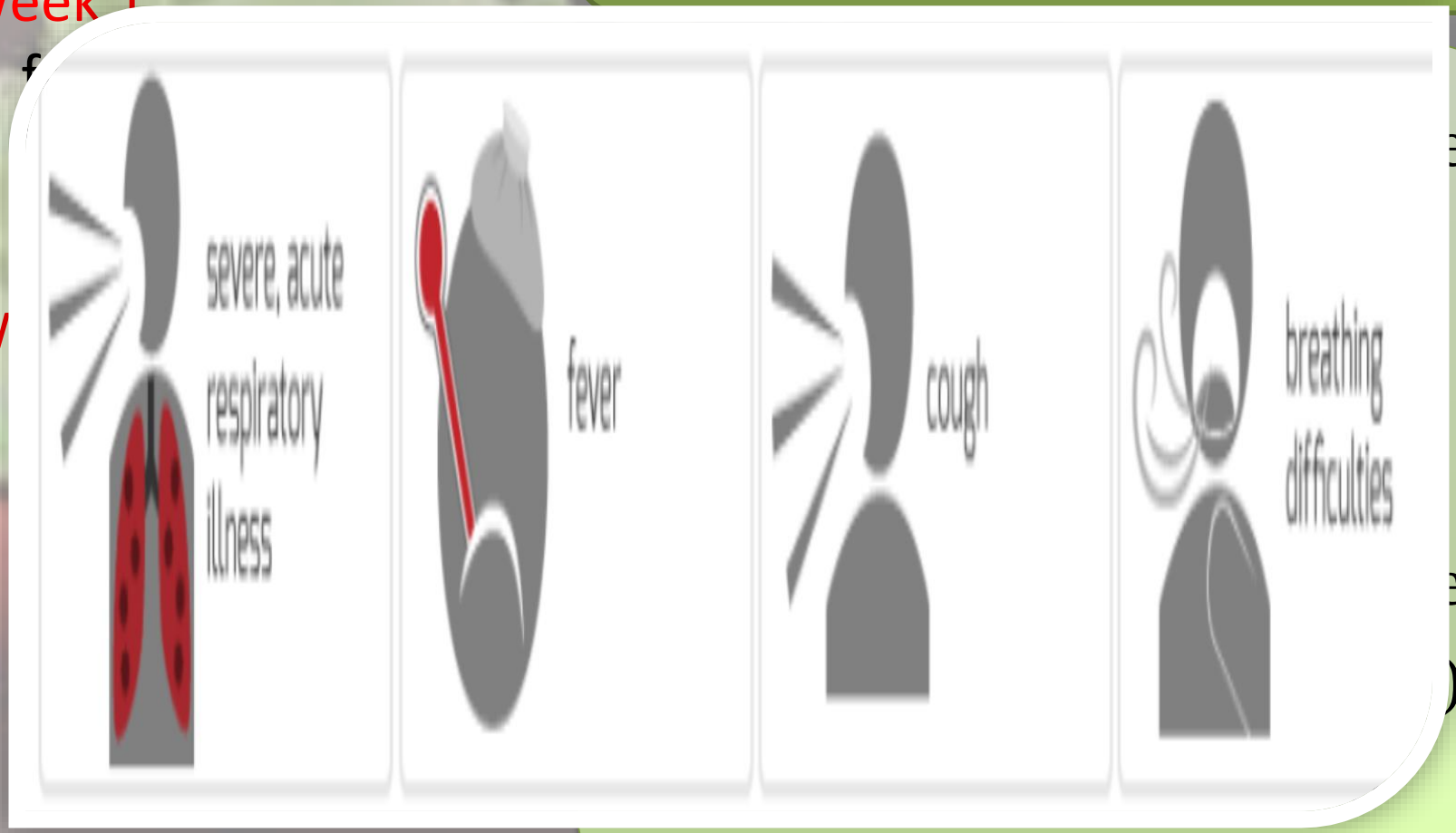
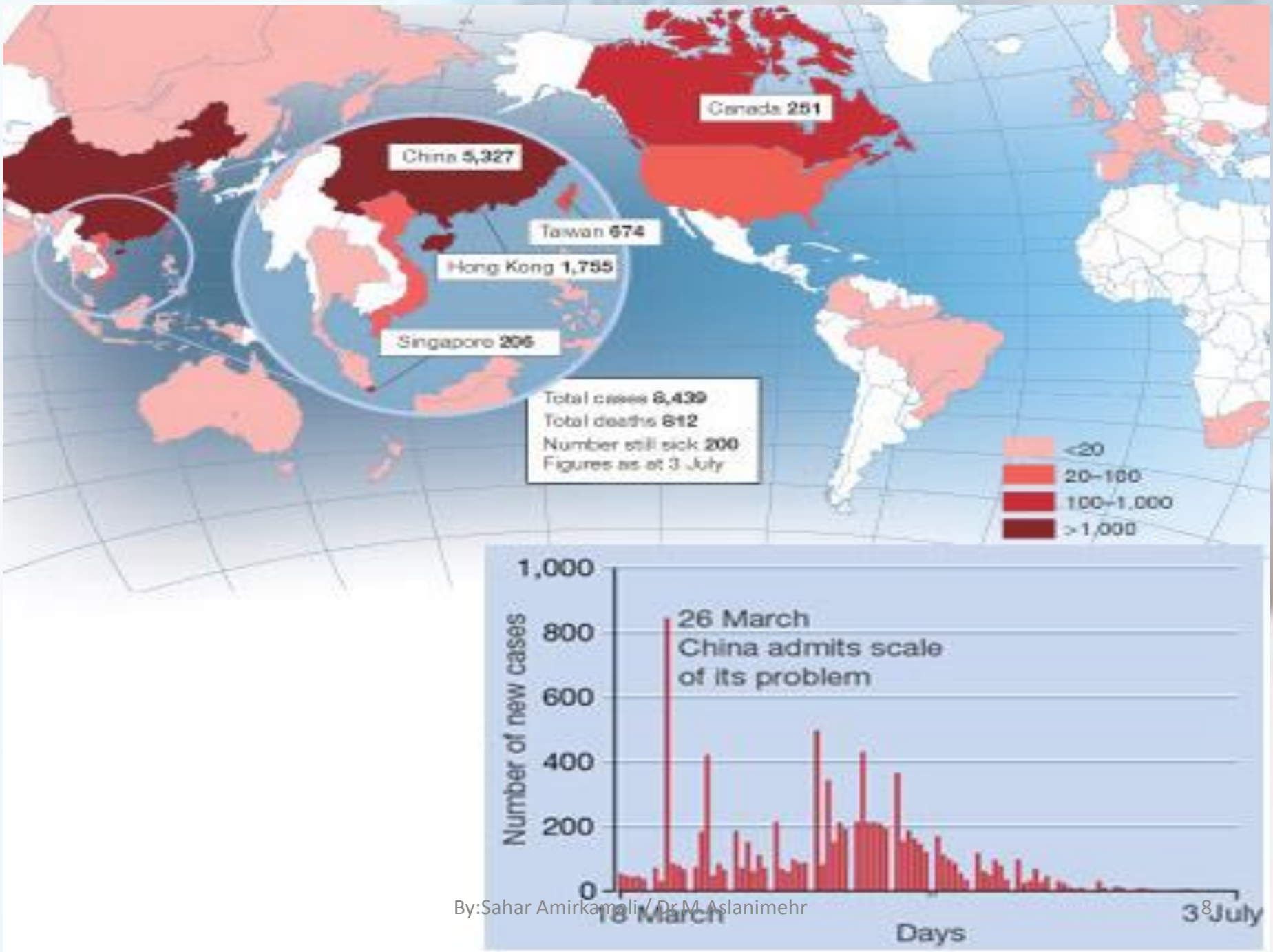
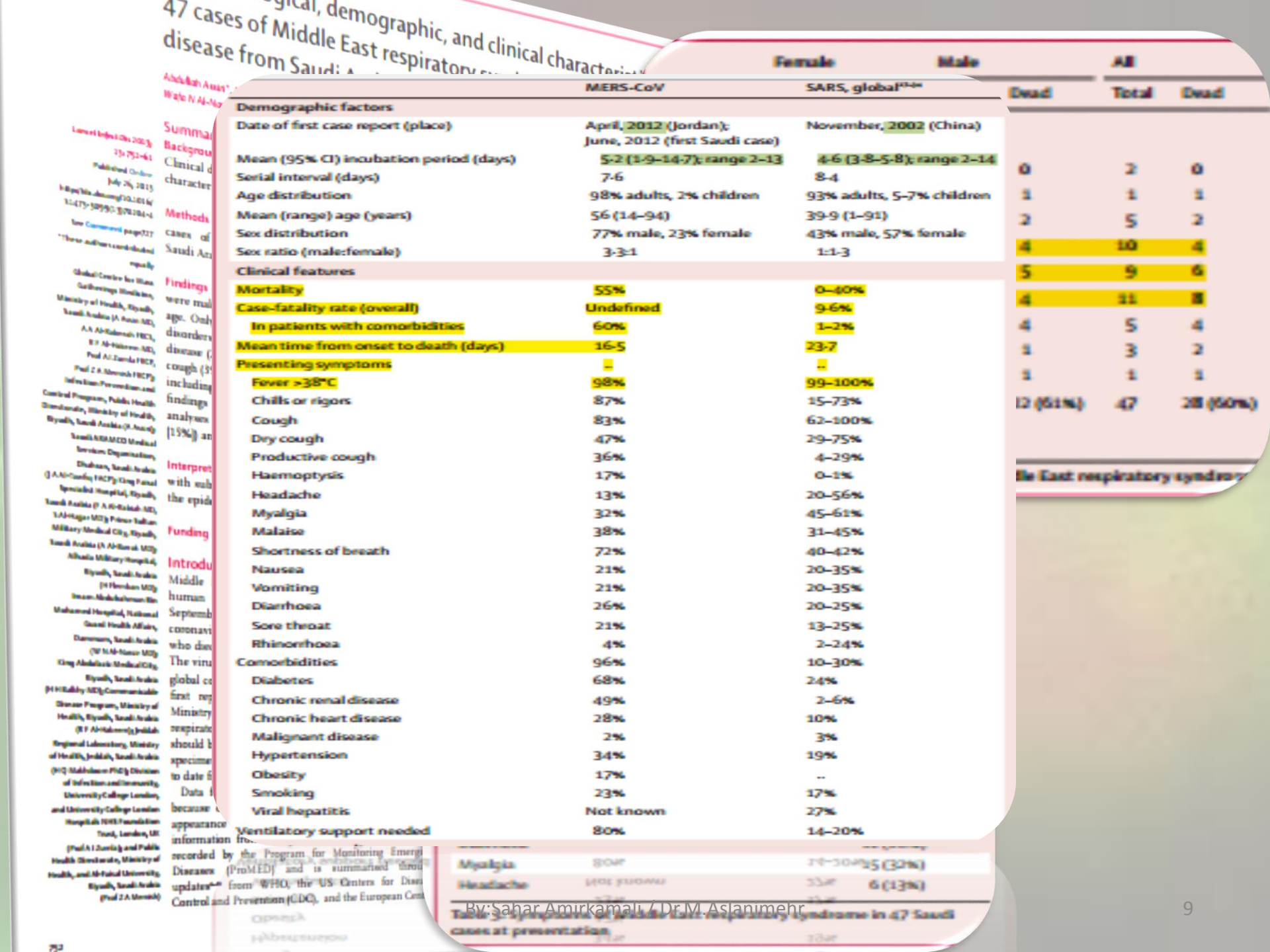


mild illness


找換店
ANGER


食
冷面


Canada 251
China 5,327
Taiwan 674
Hong Kong 1,755
Singapore 206
Total cases 8,439
Total deaths 812
Number still sick 200
Figures as at 3 July
<20
20–100
100–1,000
>1,000
1,000
800
600
400
200
0
Number of new cases
26 March
China admits scale
of its problem
18 March
3 July
Days



	MERS-CoV	SARS, global[31–34]
Demographic factors		
Date of first case report (place)	April, 2012 (Jordan); June, 2012 (first Saudi case)	November, 2002 (China)
Mean (95% CI) incubation period (days)	5·2 (1·9–14·7); range 2–13	4·6 (3·8–5·8); range 2–14
Serial interval (days)	7·6	8·4
Age distribution	98% adults, 2% children	93% adults, 5–7% children
Mean (range) age (years)	56 (14–94)	39·9 (1–91)
Sex distribution	77% male, 23% female	43% male, 57% female
Sex ratio (male:female)	3·3:1	1:1·3
Clinical features		
Mortality	55%	0–40%
Case-fatality rate (overall)	Undefined	9·6%
In patients with comorbidities	60%	1–2%
Mean time from onset to death (days)	16·5	23·7
Presenting symptoms	..	..
Fever >38°C	98%	99–100%
Chills or rigors	87%	15–73%
Cough	83%	62–100%
Dry cough	47%	29–75%
Productive cough	36%	4–29%
Haemoptysis	17%	0–1%
Headache	13%	20–56%
Myalgia	32%	45–61%
Malaise	38%	31–45%
Shortness of breath	72%	40–42%
Nausea	21%	20–35%
Vomiting	21%	20–35%
Diarrhoea	26%	20–25%
Sore throat	21%	13–25%
Rhinorrhoea	4%	2–24%
Comorbidities	96%	10–30%
Diabetes	68%	24%
Chronic renal disease	49%	2–6%
Chronic heart disease	28%	10%
Malignant disease	2%	3%
Hypertension	34%	19%
Obesity	17%	..
Smoking	23%	17%
Viral hepatitis	Not known	27%
Ventilatory support needed	80%	14–20%

Female	Male	All	
		Total	Dead
		2	0
		1	1
		5	2
		10	4
		9	6
		11	8
		5	4
		3	2
		1	1
		47	28 (60%)

Myalgia 15 (32%)

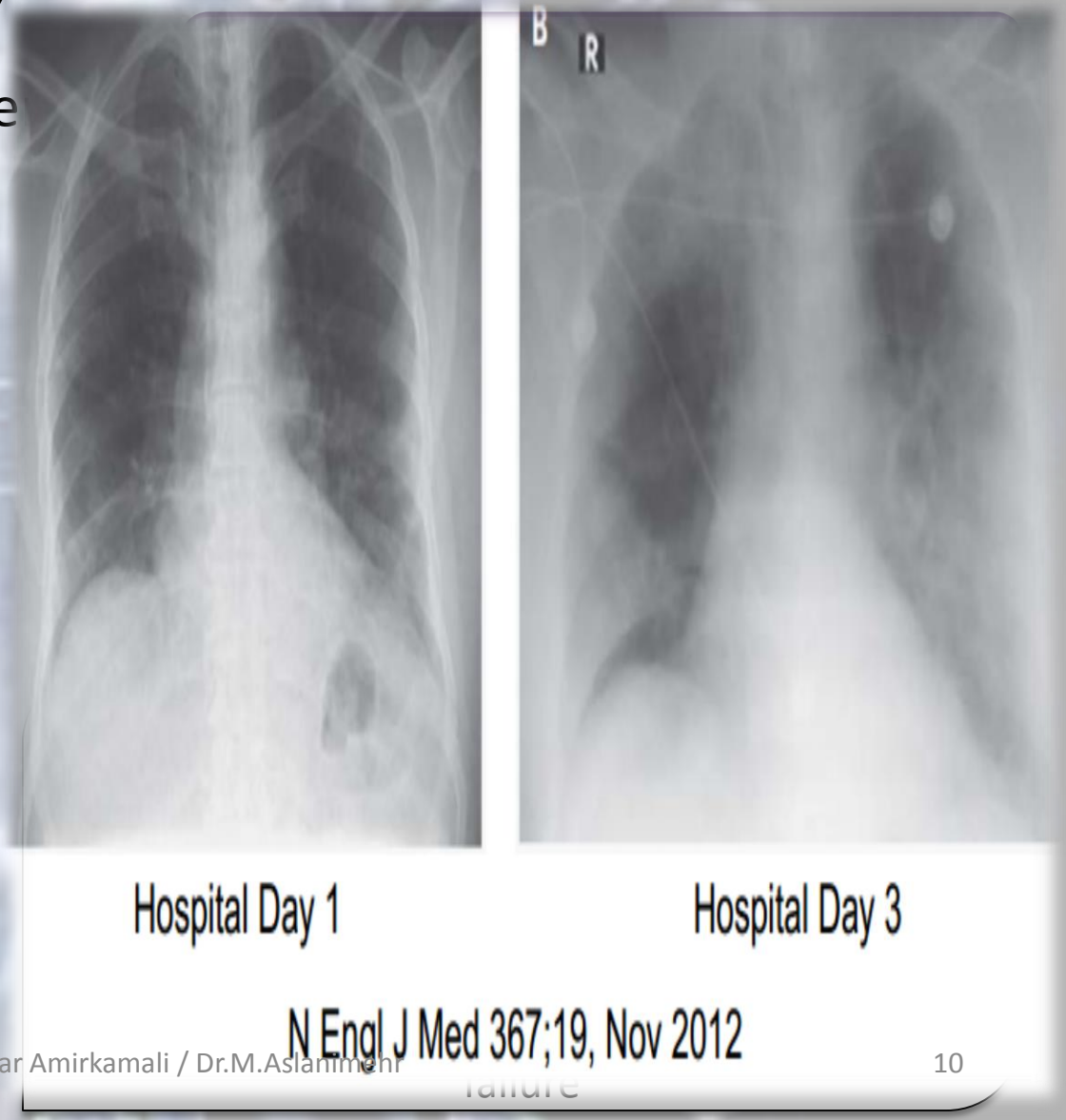
Headache 6 (13%)

Table 3: Symptoms of Middle East respiratory syndrome in 47 Saudi cases at presentation

Middle East Respiratory Syndrome

BACKGROUND

- First identified in Septembe **2012**
- Cases retrospectively identified as early as March 2012
- Different from other coronaviruses in humans, including SARS
- Most similar to coronaviruses found in bats



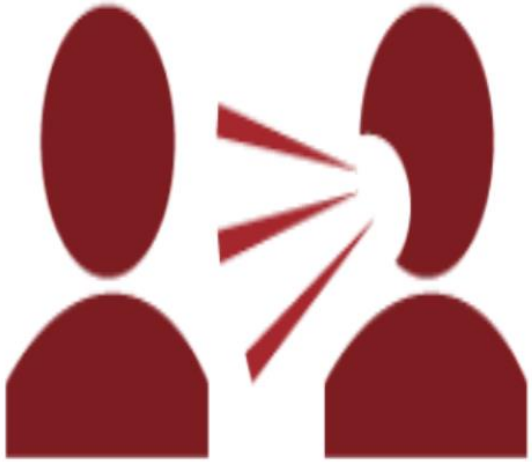
MERS-COV

Origins

TRANSMISSION

The World Health Organization has said it is not yet known how people are infected with the virus. Investigations are being conducted to determine the source of the virus, the types of exposure that lead to infection, the mode of transmission, and the clinical pattern and course of disease.

The source of MERS has yet to be determined although camels have been identified as possible carriers



Human-to-human transmission has been recorded in healthcare facilities, among family members and between co-workers. But the mechanism by which transmission occurred, whether respiratory, direct physical contact with a patient or contamination of the environment, is still unknown.

MERS-C

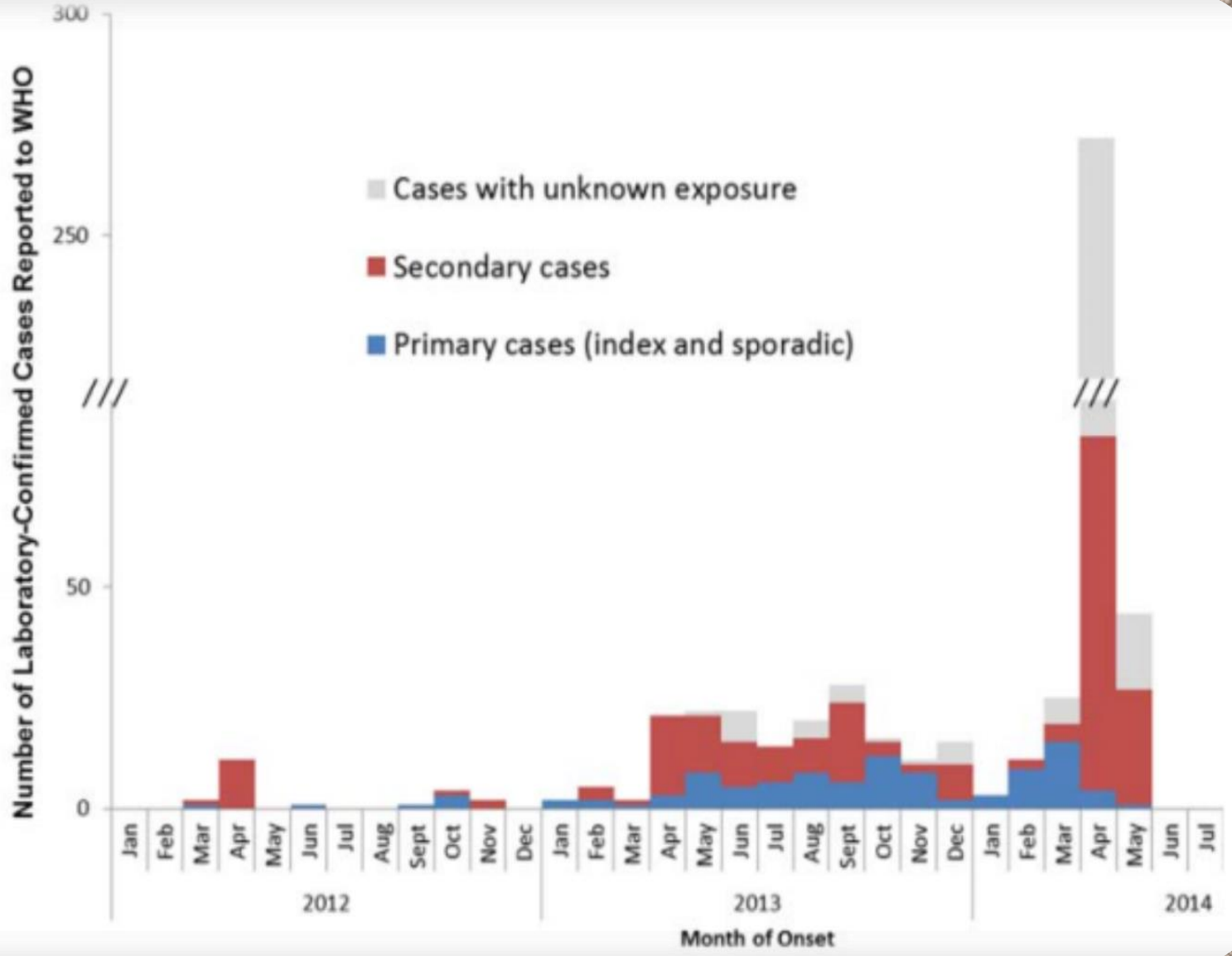
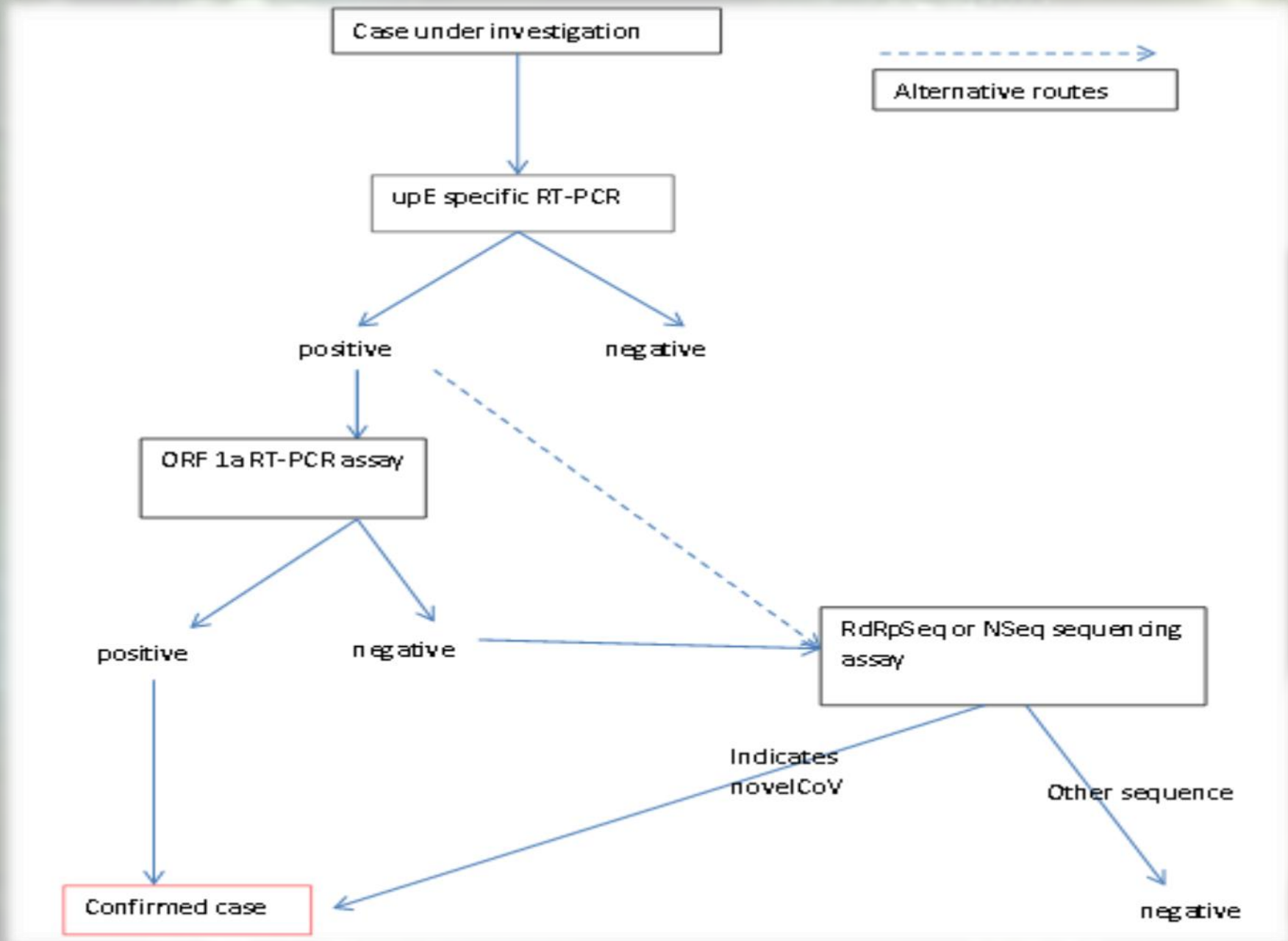


Figure 2. Epidemic cu
May 2014)

Infection Control

close contacts

Environmental Infection Control


Case under investigation
Alternative routes
upE specific RT-PCR
positive
negative
ORF 1a RT-PCR assay
positive
negative
RdRpSeq or NSeq sequencing assay
Indicates novelCoV
Other sequence
Confirmed case
negative

PRECAUTIONS AGAINST MERS

1. Frequently wash your hands with soap or hand rubs with alcohol.

2. Practice proper cough etiquette by covering your mouth and nose while sneezing or coughing. Use facial tissues and dispose in a waste basket.

3. Avoid contact with farm and domesticated animals, including camels.

4. Avoid contact with the sick or those infected with MERS-CoV. If you have respiratory illness, stay home and wear a surgical mask to protect your family.

5. If you are a health worker, strictly follow infection control protocols in your work.

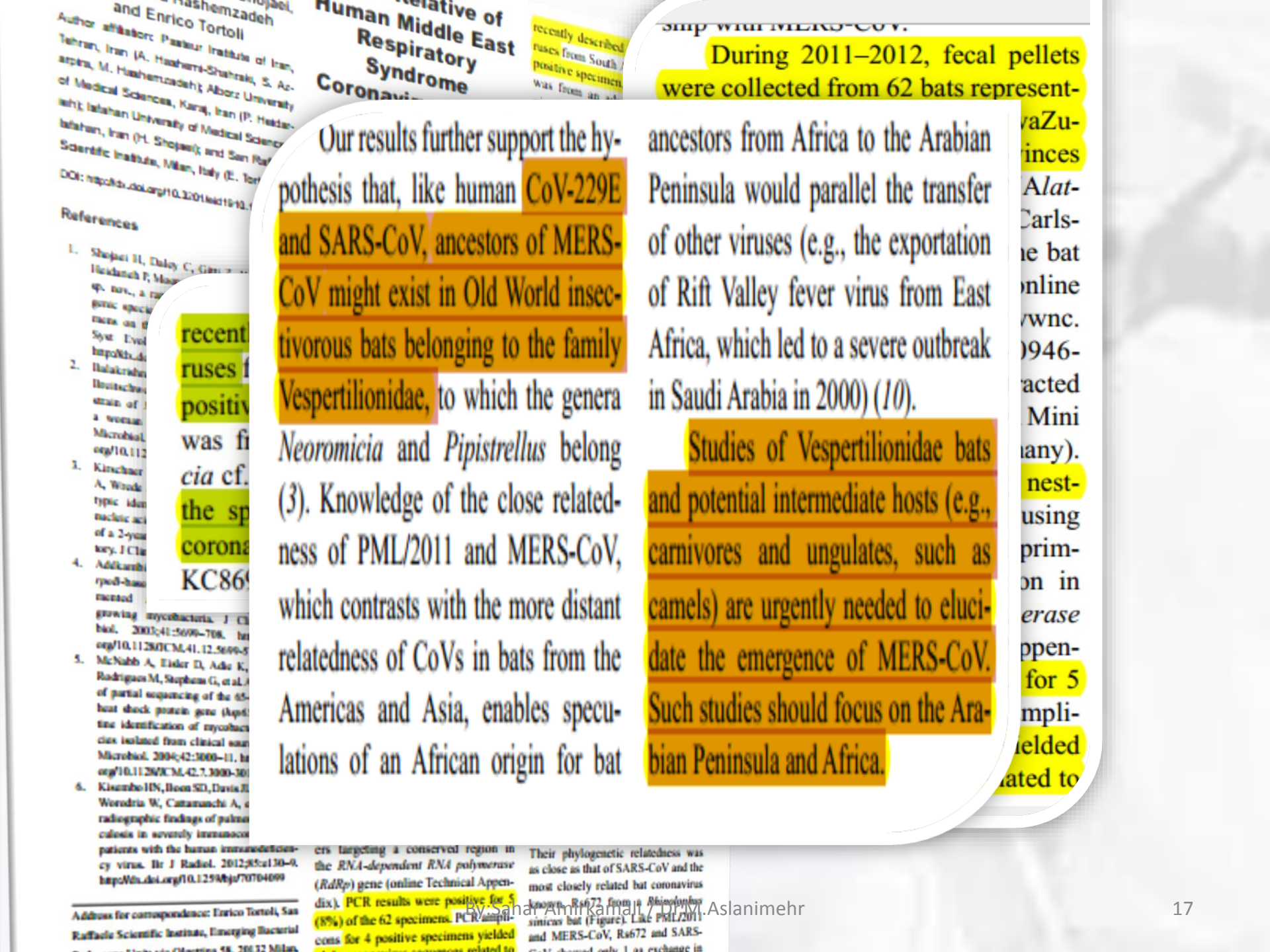
6. Visit your doctor, a hospital or health facility immediately if symptoms of MERS-CoV manifest, including persistent coughing.

7. If you were in close contact with a confirmed MERS-CoV patient, comply with local health regulations and postpone any trip abroad until after test results are negative.

8. Get regular exercise, eat a balanced diet, and get adequate sleep as all these will help strengthen the body's immunity.

GMA NEWS

Source: Department of Health and Department of Foreign Affairs, World Health Organization
Text by Amita Legaspi
Design by Analyn Perez



Our results further support the hypothesis that, like human CoV-229E and SARS-CoV, ancestors of MERS-CoV might exist in Old World insectivorous bats belonging to the family Vespertilionidae, to which the genera *Neoromicia* and *Pipistrellus* belong (*3*). Knowledge of the close relatedness of PML/2011 and MERS-CoV, which contrasts with the more distant relatedness of CoVs in bats from the Americas and Asia, enables speculations of an African origin for bat ancestors from Africa to the Arabian Peninsula would parallel the transfer of other viruses (e.g., the exportation of Rift Valley fever virus from East Africa, which led to a severe outbreak in Saudi Arabia in 2000) (*10*).

Studies of Vespertilionidae bats and potential intermediate hosts (e.g., carnivores and ungulates, such as camels) are urgently needed to elucidate the emergence of MERS-CoV. Such studies should focus on the Arabian Peninsula and Africa.

receptor usage and cell entry of bat coron
provide insight into bat-to-human tran
MERS coronavirus

Yang Yang[a,1], Lanying Du[b,1], Chang Liu[a,1], Lili Wang[b], Cuiqing Ma[b], Jian Tang[b], and Fang Li[a,2]

Middle East respiratory syndrome coronavirus (MERS-CoV) currently spreads in humans and causes ~36% fatality in infected patients. Believed to have originated from bats, MERS-CoV is genetically related to bat coronaviruses HKU4 and HKU5. To understand how bat coronaviruses transmit to humans, we investigated the receptor usage and cell entry activity of the virus-surface spike proteins of HKU4 and HKU5. We found that dipeptidyl peptidase 4 (DPP4), the receptor for MERS-CoV, is also the receptor for HKU4, but not HKU5. Despite sharing a common receptor, MERS-CoV and HKU4 spikes demonstrated functional differences. First, whereas MERS-CoV prefers human DPP4 over bat DPP4 as its receptor, nd, in the absence of exog- KU4 spikes mediate pseu- ERS-CoV spike, but not human cells. Thus, e human DPP4 and ell entry, contribut- V in humans. These for HKU4 and host for HKU4. They also es threaten human lapt to human cells

Significance

A constant and long-term threat to human health is cross-species transmission of Middle East respiratory syndrome coronavirus (MERS-CoV) from bats to humans. However, this process is poorly understood. Examining the cross-species transmissibility of bat coronavirus HKU4, which is genetically related to MERS-CoV, can provide critical information about the likely causes of MERS-CoV infections in humans. Here we investigate the receptor usage and cell entry mechanism of HKU4 compared with MERS-CoV. Our results reveal that MERS-CoV has adapted to use human receptor and cellular proteases for efficient human cell entry, whereas HKU4 can potentially follow-up and also infect human cells. These findings are critical for aluating emerging disease potentials of bat coronaviruses or preventing and controlling their spread in humans.

Related Studies

- 2014 ,Jean Kaoru Millet and Gary R. Whittaker1, Host cell entry of Middle East respiratory syndromecoronavirus after two-step, furin-mediated activationof the spike protein.

  2014, Yang Yang, Receptor usage and cell entry of bat coronavirus HKU4provide insight into bat-to-human transmission ofMERS coronavirus

  Assiri A,MERS-CoV Investigation Team. Hospital Outbreak of Middle East Respiratory Syndrome Coronavirus. N Engl J Med. 2013 Jun 19. [Epub ahead of print].

  Guery B,the MERS-CoV study group. Clinical features and viral diagnosis of two cases of infection with Middle East Respiratory Syndrome coronavirus: a report of nosocomial transmission. Lancet. 2013 May 30.

  http://emergency.cdc.gov/coca


THANK
YOU